Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of	)	
	)	
Amendment of the Commission's Rules with Regard to Commercial Operations in the 1695-1710 MHz, 1755-1780 MHz, and 2155-2180 MHz Bands	)	GN Docket No. 13-185

COMMENTS OF NOKIA SOLUTIONS AND NETWORKS

Derek Khlopin
Head of Government Relations
North America

Prakash Moorut
Senior Research Specialist
Technology & Innovation

575 Herndon Parkway
Suite 200
Herndon, VA 20170

September 18, 2013

TABLE OF CONTENTS

I. INTRODUCTION 4

II. HARMONIZATION OF THE SPECTRUM BANDS IS CRITICAL 5

III. TOOLS ARE AVAILABLE FOR OPENING UP ACCESS TO 1755-1780 MHZ FOR NEW COMMERCIAL LICENSEES 7

A. The CSMAC Working Group Reports Include Important Findings Even Though Further Study is Necessary. 8

B. Time-Based Sharing - Authorized or Licensed Shared Access Can Be a Long Term Sharing Solution When Proven Viable on Technical and Economic Grounds 13

C. Proven Techniques Carrier Aggregation and Supplemental Downlink Could be Employed 16

IV. NSN RECOMMENDATIONS REGARDING TRANMSIT POWER OF MOBILE AND PORTABLE STATIONS IN THE 1695-1710 MHZ AND 1755-1780 MHZ BANDS 20

VI. CONCLUSION 22

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of	)	
	)	
Amendment of the Commission's Rules with Regard to Commercial Operations in the 1695-1710 MHz, 1755-1780 MHz, and 2155-2180 MHz Bands	)	GN Docket No. 13-185

Comments of Nokia Solutions and Networks

Nokia Solutions and Networks ("NSN") hereby responds to the Commission's Notice of Proposed Rulemaking ("NPRM")[1] seeking comment on licensing and technical rules for additional Advanced Wireless Services ("AWS") spectrum, including the spectrum identified in the caption of the proceeding, above. NSN in particular strongly supports the pairing, auctioning and licensing of the 1755-1780 MHz and 2155-2180 MHz bands in order to help meet the constantly escalating demand for additional spectrum needed to support bandwidth intensive commercial mobile broadband services in the United States. The Commission should take all steps within its power to ensure the timely clearing of 1755-1780 MHz, working with its federal government counterparts to help facilitate the relocation of incumbents. While clearing must remain the objective and priority, in the meantime commercial access to the spectrum should be permitted as quickly and broadly as possible, an outcome seemingly possible in light of existing and emerging wireless industry innovations.

[1] *Amendment of the Commission's Rules with Regard to Commercial Operations in the 1695-1710 MHz, 1755-1780 MHz and 2155-2180 MHz Bands*, GN Docket No. 13-185, Notice of Proposed Rulemaking, FCC 13-102 (rel. July 23, 2013) ("NPRM").

I. INTRODUCTION.

NSN is the world's specialist in mobile broadband. Innovating at the forefront of each generation of mobile technology, NSN provides the world's most efficient mobile networks, the intelligence to maximize the performance of these networks, and the services to make it all work seamlessly. NSN is gaining recognition for leading the commercialization of Long Term Evolution (LTE), in terms of references[2] and performance.[3] This includes pioneering efforts in reducing the footprint of mobile base station infrastructure, from compact yet full power macro sites down to the full range of "small cell" solutions, helping to increase both the coverage and capacity of mobile networks. NSN's efforts to promote efficient and optimal network performance include the industry's most comprehensive portfolio of services for integrating heterogeneous networks ("HetNets"), encompassing analysis, optimization, deployment and management. NSN also is bringing innovation to the network edge, as its pioneering Liquid Applications technology allows for frequently accessed content to be cached locally at the base station in order to enable efficient consumer access to highly valued content.

As the Commission recognizes in the NPRM, demand for mobile broadband connectivity continues to increase dramatically with no end in sight. This of course is putting a corresponding amount of strain on mobile networks. Although technological innovations are helping to increase the efficiency of mobile networks, and such enhancements are being incorporated into global industry standards, the need for additional spectrum to help meet the spectrum challenge is abundantly clear. The spectrum bands raised in the NPRM can play an important role, assuming

[2] As of September 12, 2013, NSN had 92 commercial references in place for the delivery of LTE.

[3] ABI Research recently ranked NSN tops in its macro base station Competitive Assessment (excerpt *available at* http://www.nokiasiemensnetworks.com/file/26071/abi-research-ranks-nokia-siemens-networks-no-1-macro-base-station-vendor).

that they are made commercially available in a timely fashion, the allocations are globally harmonized to the maximum extent feasible, and potential licensees are afforded enough certainty regarding their spectrum access rights.

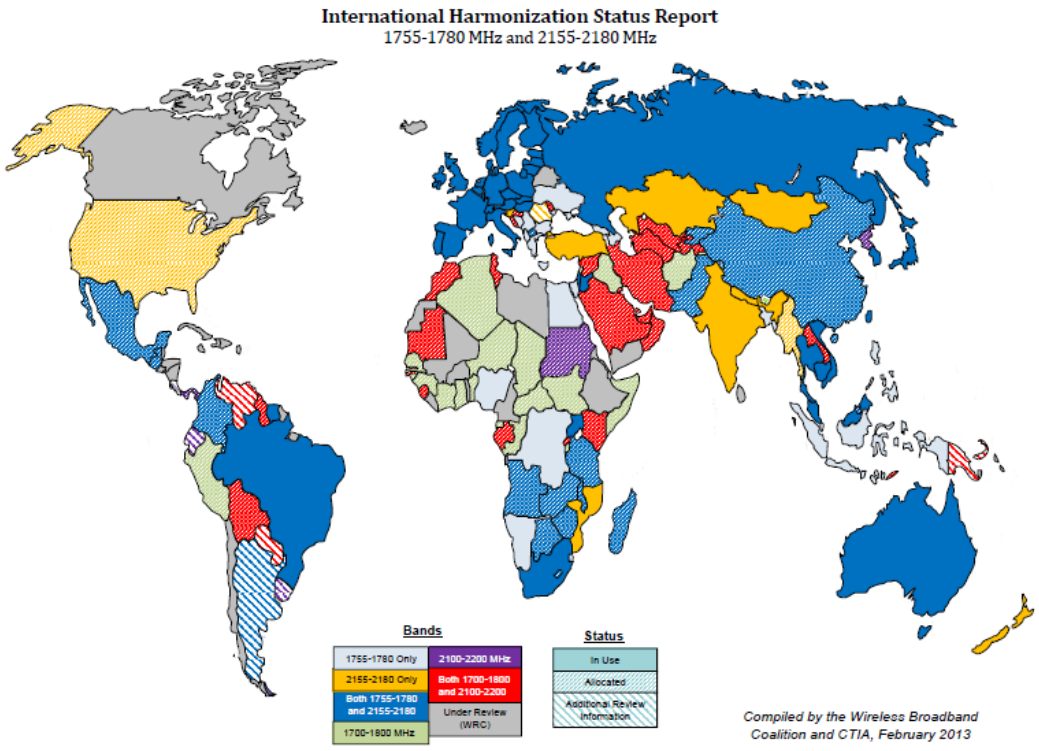
II. HARMONIZATION OF THE SPECTRUM BANDS IS CRITICAL.

NSN supports the Commission's proposal for 1755-1780 MHz to be paired as uplink spectrum with 2155-2180 MHz for downlink (referred to "AWS-3"). This 1755-1780/2155-2180 MHz combination is particularly attractive to the wireless industry because of its immediate adjacency to the 1710-1755/2110-2155 MHz band, or the AWS-1 band, one of the most used bands for mobile broadband services in North America. 1695-1710 MHz also is adjacent to AWS-1 and proposals have been made to pair it with 2095-2110 MHz, which would maintain consistent duplex spacing across the AWS range. The Commission should continue to explore this possible pairing. In fact, it may be a means for the Commission to satisfy the Spectrum Act's requirement that it reallocate an additional 15 MHz of spectrum for commercial broadband services.[4]

1755-1780 MHz is allocated in many parts of the world for terrestrial systems and the International Telecommunications Union (ITU) has identified it for International Mobile

[4] Middle Class Tax Relief and Job Creation Act of 2012, Pub. L. No. 112-96, 126 Stat. 156 (2012) ("Spectrum Act") §6401.

Telecommunications (IMT). CTIA-The Wireless Association and the Wireless Broadband Coalition released a global status report and map on the allocation of 1755-1780 MHz and 2155-2180 MHz spectrum, which showed a number of countries have or are in the process of allocating this harmonized spectrum for commercial purposes.[5] Once the U.S. follows the numerous international governments that have allocated these bands, the wireless industry and especially consumers will benefit from the economies of scale, ranging from shorter time to deployment, lower cost for devices and networks, and better international roaming.



International harmonization status in the 1755-1780 and 2155-2180 MHz

The 1755-1780/2155-2180 MHz pairing in the U.S., when made available, would overlap with the 1710-1770/2110-2170MHz band (3GPP Band Class 10), which has been identified for

[5] http://files.ctia.org/pdf/1302.Harmonization_Status_Report.Country-by-Country_Data.pdf.

IMT by the ITU and consequently made available in many countries in the Americas. Ongoing work in the regional Organization of American States Committee on International Telecommunications (CITEL)[6] would extend this band by 10+10 MHz (1770-1780/2170-2180 MHz), as in the U.S., which would help develop a regional ecosystem for AWS spectrum.

Unlocking the AWS-3 spectrum in the U.S. will secure device/chipset roadmaps, bring economies of scale for the entire Americas and encourage governments to release the full potential AWS spectrum. Several countries in the Americas region have auctioned the AWS-1 band (1710-1755/2110-2155 MHz), among these the U.S. (2008), Canada (2008), Mexico (2010), Chile and Columbia (2013). Argentina, Paraguay and Peru have announced plans to award this spectrum. In addition, the 15+15 MHz in the 1755-1770/2155-2170 MHz band could be made available in many countries in Latin America. While many countries have indicated an interest in bringing this portion of the band to market, largely due to the lack of economies of scale in devices supporting this band, none have done so yet. Finally, CITEL is considering an additional 10+10 MHz in the 1710-1780/2110-2580 MHz in the Americas for broadband mobile services.[7]

III. TOOLS ARE AVAILABLE FOR OPENING UP ACCESS TO 1755-1780 MHZ FOR NEW COMMERCIAL LICENSEES.

Government and industry are now aligned in moving towards commercial access to 1755-1780 MHz. As discussed below, the CSMAC working groups established to examine relocation and potential sharing scenarios have submitted their reports. In a letter to NTIA, filed with the Commission, the Department of Defense laid out its proposals for steps to be taken that can

---

[6] CCP.II-RADIO/doc. 3295/13 Draft Recommendation on "Use of 1710-1780 / 2110-2180 MHz BANDS IN THE AMERICAS FOR BROADBAND MOBILE SERVICES", 11 April 2013, *available at* http://www.oas.org/es/citel/P2!R.htm.

[7] *Id*.

afford industry near term access to the band.[8] This was subsequent to the submission of an *Industry Roadmap* setting out a proposed timeline.[9] These developments demonstrate unmistakable, if incomplete, progress.

A. The CSMAC Working Group Reports Include Important Findings Even Though Further Study is Necessary.

The National Telecommunications and Information Administration (NTIA), through the Commercial Spectrum Management Advisory Committee (CSMAC), established five Working Groups (WGs) "to facilitate the implementation of commercial wireless broadband in the 1695-1710 MHz and 1755-1850 MHz band."[10] Each of the WGs was instructed to "explore ways to lower the repurposing costs and/or improve or facilitate industry access while protecting federal operations from adverse impact"[11] and tasked with producing "written outputs recommending to the CSMAC concerning approaches to sharing, transition and/or relocation of the band that will determine the steps that will have to be taken and any factors that may reduce the projected costs, or limitations or restrictions on spectrum availability."[12]

---

[8] Letter from Teresa M. Takai, Chief Information Officer, Department of Defense, to Lawrence E. Strickling, Assistant Secretary for Communications and Information, National Telecommunications & Information Administration, U.S. Department of Commerce (July 17, 2013), *attached to* Letter from Karl B. Nebbia, Associate Administrator, Office of Spectrum Mgmt., NTIA, to Julius P. Knapp, Chief, Office of Engineering and Technology, Federal Communications Commission, GN Docket No. 09-51, ET Docket No. 10-123 (filed July 22, 2013).

[9] Letter from Steve Sharkey, T-Mobile U.S., Inc., to Marlene H. Dortch, Secretary, Federal Communications Commission, WT Docket Nos. 10-123, 07-195 (dated Jun. 24, 2013), Attachment, *Industry Roadmap to Assessing the 1755-1850 MHz Band* ("*Industry Roadmap*").

[10] U.S. Department of Commerce, National Telecommunications and Information Administration, *Framework for Work within CSMAC*, May 25, 2012 ("*CSMAC Framework*"*), available at* http://www.ntia.doc.gov/files/ntia/meetings/framework_for_work_within_csmac_20120525.pdf, at 1.

[11] Instructions to CSMAC Working Groups, June 28, 2012, pg. 1.

[12] CSMAC Framework at 2.

The CSMAC WGs worked for approximately a year to develop and release their analyses and recommendations as they complete their work. In particular, the WGs have been deriving protection distances for two interference scenarios:

- government system receiver as potential victim of interference from LTE devices and
- government system transmitter as potential source of interference to LTE base stations.

The Commission observed that not all of the final reports were publicly available when the NPRM was issued.[13] NSN therefore highlights the work done in Working Group 5 (WG-5)[14] in particular, which focused on the variety of federal government airborne systems operating in the 1755-1850 MHz band and on "protection requirements for federal operations" and "[u]nderstanding of periodic nature and the impact to commercial wireless of federal government airborne operations." Because of the range of federal airborne systems, WG-5 established four Sub-Working Groups (SWG)—SWG-1 Aeronautical Mobile Telemetry (AMT); SWG-2 Small Unmanned Aircraft Systems (SUAS); SWG-3 Air Combat Training System (ACTS); and SWG-4 Precision-Guided Munitions (PGMs) and other miscellaneous airborne systems. WG-5 and each of its SWGs included representatives from the federal government and industry (primarily representatives of wireless and other technology manufacturers, commercial wireless service providers and other stakeholders).

As an overall summary, Working Group 5's SWGs completed electromagnetic compatibility (EMC) analyses based on an approach and assumptions agreed to as a baseline at the WG-5 level. In addition, at the conclusion of the current SWG efforts, methods for refining the baseline analysis and possible interference mitigation techniques for follow-on efforts were

[13] *NPRM* at ¶34.
[14] CSMAC WG 5 Final Report, "1755-1850 MHz Airborne Operations (Air Combat Training System, Small Unmanned Aircraft Systems, Precision-Guided Munitions, Aeronautical Mobile Telemetry)," July 23, 2013, *available at* http://www.ntia.doc.gov/files/ntia/publications/wg5_final_report_7-22_dfo.pdf.

proposed. The WG-5 report contains several factors proposed for future study, which may in fact lead to the ability to significantly alter the technical analysis done and potentially change the conclusions underlying the report. For a range of reasons, these factors were not able to be included in the current analysis, hence agreement to identify them for possible next steps in the WG-5 report.

NSN therefore recommends that the Commission take into consideration these factors when considering the outcome of the CSMAC WG-5 work as part of its deliberations in this proceeding. However, while more work could be done to further refine the technical analysis, the Commission should in no way delay the auction of the AWS spectrum. Commercial licensees post-auction can get access to the spectrum in various ways. Below, NSN elaborates on the time-based sharing approach called Licensed Shared Access (LSA) identified by CSMAC WG-5 as a possible longer term solution as well on proven techniques such as Carrier Aggregation and Supplemental Downlink that could enable use of the spectrum in the shorter term until the viability and implementation details of LSA and other future solutions as applied to the AWS band are sorted out. Like any technical solution, it will depend on the cost and complexity of implementation of LSA compared with its benefits to commercial licensees. To make that determination, more precise information about which federal government systems will be relocated versus what systems will stay in the band is needed along with information on the locations of these systems, for how long they will stay in the band and how they use the spectrum.

The items identified by CSMAC WG-5 for potential follow-up work and research are:

1. **Possible Effects of Clutter and Terrain** – The ground-to-ground analyses conducted in WG-5 took into account terrain effects via the features included in the Irregular Terrain Model

(ITM) in conjunction with a USGS terrain database. The air-to-ground analyses did not take into account terrain effects. Whether to do so, and how to do so, in future analyses remains under discussion. In particular, additional study of the impact that clutter and terrain have on propagation, particularly in air-to-ground analysis, would provide greater confidence in the analysis and may have the potential to significantly impact protection distances.

2. Time-Based Sharing – The commercial wireless industry presented information on proposed innovative spectrum sharing techniques (*e.g.*, time-based sharing or real time monitoring via LSA) that could exploit the advanced features in the LTE standards to enable use of spectrum assigned to government users without impact to operations. These mechanisms have the potential to facilitate sharing by enabling commercial wireless licensees to dynamically relinquish their use of the shared spectrum with minimal impact to users in areas during times that government users are using the band. The proposal did not include the implementation details and would need further study.

3. Effects of frequency off-tuning – Frequency off-tuning would avoid co-channel operation of the commercial systems on channels the government systems are using. The implementation details of frequency off-tuning, via dynamic techniques (e.g., described in item 1 above) or static methods, to enable commercial use of the band while ensuring protection of federal operations and the magnitude of protection distance reduction would require study.

4. Possible notches in wireless use of frequencies at selected locations – Commercial wireless industry representatives provided information on innovative spectrum sharing techniques that take advantage of advanced features in LTE technology to notch out a portion of an LTE UE uplink channel at times and locations when government agencies are using the spectrum. This mechanism could be used to avoid co-channel operation with potentially minimal

impact on private sector users in cases where the government signals are narrow relative to an LTE channel. The implementation details of how the LTE technology would notch out spectrum to enable commercial use of the band while ensuring protection of federal operations and the magnitude of any reduction of separation distances due to notching requires study.

5. Consideration of different interference threshold based on the desired signal-to-noise plus interference level desired rather than defining interference as a rise in the noise floor – Current WG-5 analysis uses long-standing interference criteria established by the ITU. While there is no desire to modify the internationally accepted criterion, the wireless industry believes that the study of interference relative to a desired carrier taking into account actual system operations would be beneficial to understand how government and LTE systems would interact in a shared environment with close coordination between users, and believes that it could significantly reduce required separation distances.

6. UE Antenna Height and Network Loading – In the LTE Baseline document, the WG-1's LTE parameters document defined the antenna height for UEs to be 1.5 meters above ground level and the WG-5 analyses were completed using this height. In a realistic deployment, a number of UEs in urban and rural environments could be at different heights above ground level. For follow-on analysis to refine the protection distances, it may be necessary to define and agree on a realistic range of antenna heights for urban and rural environments.

7. Consideration of government assignment information and the potential to prioritize access to markets prioritized by the commercial wireless industry – Government frequency assignments could be made in a way that minimizes impact to markets that the commercial wireless industry prioritizes, which has the potential to improve the economic

viability of sharing for commercial users without having an adverse impact on the ability of the federal agencies to meet their missions.

B. Time-Based Sharing – Authorized or Licensed Shared Access Can Be a Long Term Sharing Solution When Proven Viable on Technical and Economic Grounds.

The Commission seeks comments on sharing measures that would maximize commercial access to the spectrum. The Industry Roadmap proposes that through a combination of sharing, relocation and channel prioritization for the majority of operations in the 1755-1780 MHz band, it appears feasible to provide industry early access to the 1755-1780 MHz portion of the band.[15] In some cases, additional analysis may need to continue to further refine long-term arrangements for the entire band, including potential long-term sharing in the 1755-1780 MHz band and/or other frequency bands as appropriate. The additional analysis could not only further refine the static exclusion zone sizes as needed but also develop innovative spectrum sharing techniques that exploit the more dynamic nature of the use of the spectrum and the advanced features in the LTE standards that CSMAC WG-5 in particular has started to discuss.

One such innovative spectrum sharing technique, as noted earlier, is Licensed Shared Access (LSA), also sometimes called Authorized Shared Access (ASA),[16] identified in WG-5 as a promising next step that requires further study. It is to be noted that the Commission is also considering ASA/LSA in the 3.5GHz proceeding.[17]

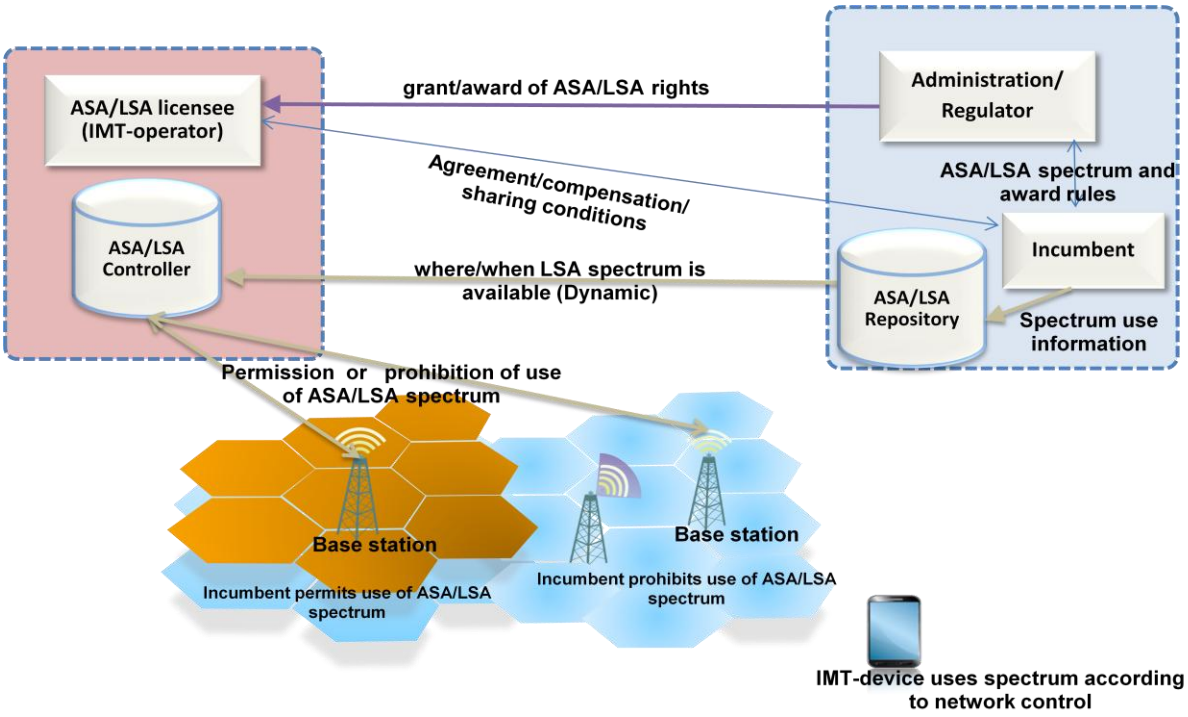
---

[15] *NPRM* at ¶22.

[16] NSN uses the acronyms LSA and ASA interchangeably throughout these comments.

[17] *See Amendment of the Commission's Rules with Regard to Commercial Operations in the 3550-3650 MHz Band*, GN Docket No. 12-354, Notice of Proposed Rulemaking, FCC 12-148 (rel. Dec. 12, 2012), *¶84.*

ASA/LSA is a third and complementary way of authorizing spectrum, in addition to licensed (exclusive) and license-exempt (unlicensed). The reality is that the AWS-3 spectrum even today is not used at all times and in all locations by federal government users. Irrespective of incumbent relocation (which to emphasize again is strongly preferred), the spectrum could be made available for commercial mobile broadband usage in the time, location/geography, and/or frequency domains. In many cases, this spectrum is not used across an entire nation or licensed area at all times – the spectrum is unused in various locations and/or at times.



Example of ASA/LSA architecture

The ASA's architecture includes two main components:

- ASA Repository: This database contains the relevant information on spectrum use by the incumbent (in the spatial, frequency and time domains). There could be one or more repositories

per country. The ASA Repository may be directly managed by the regulator or the incumbent, or be delegated to a trusted third party.

• ASA Controller: The ASA Controller computes ASA spectrum availability based on certain rules and information on the incumbent's use provided by the ASA Repository. It connects to the ASA Repository through a secure and reliable interface. There could be one or multiple ASA Controllers per country. The ASA Controller can interface with one or multiple ASA Repositories as well as with one or multiple ASA networks. The ASA Controller may be managed by the regulator, the ASA licensee(s) or a trusted third party.

ASA/LSA licensees use the spectrum for mobile broadband on a shared but non-interference basis with the incumbents. Sharing under the ASA/LSA framework is binary by nature, as it permits spectrum use by either the incumbent or the ASA/LSA licensee at a given location, at a given time, and on a given frequency. The ASA/LSA licensee enjoys exclusive spectrum rights of use where and when the spectrum is not used by the incumbent. When the incumbent needs the spectrum back, the ASA/LSA licensee will need to vacate the spectrum and likely will shift to another spectrum band to ensure a seamless QoS experience to his customer base. ASA/LSA especially targets frequency bands that are already, or have the potential to become, globally harmonized mobile bands. The AWS-3 spectrum has the potential to become such a significantly harmonized band as explained before**.**

However, as explained in the CSMAC WG-5 report,[18] the ASA/LSA proposal as a promising way forward for sharing "*did not include the implementation details and would need further study. Both government and industry interests writ large should work together to further*

[18] CSMAC WG 5 Final Report July 23rd 2013, "1755-1850 MHz Airborne Operations (Air Combat Training System, Small Unmanned Aircraft Systems, Precision-Guided Munitions, Aeronautical Mobile Telemetry)," *available at* http://www.ntia.doc.gov/files/ntia/publications/wg5_final_report_7-22_dfo.pdf.

study these approaches, sharing as much information as practicable about the systems that are envisioned to share using such mechanism, as well as the projected operational aspects and economically acceptable conditions, to determine feasibility of sharing without a negative impact to both government and commercial operations. This study should include the feasibility of the time-based sharing Licensed Shared Access regulatory construct. This study should also include the potential impact on government operations and proposed commercial operations in this band, and the implementation details on the real-time/near real-time information requirements for both government and commercial wireless licensees, whether it is via a database or some other secure means. Further, the study should consider the economic acceptability of the proposal."

While the technical, regulatory and economic viability of future solutions like LSA as applied to the AWS-3 spectrum is further studied and the related standards are defined, the spectrum can also be used via coordination zones and/or other techniques that are already proven as discussed below.

C. Proven Techniques Carrier Aggregation and Supplemental Downlink Could be Employed.

Carrier Aggregation

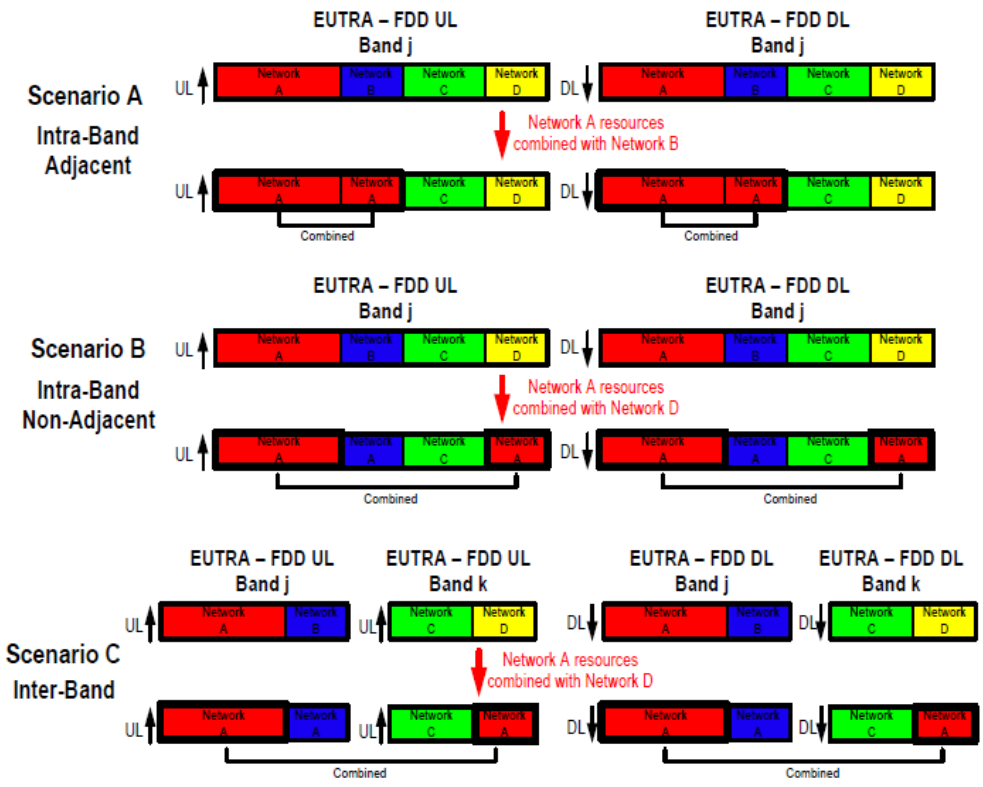
Carrier Aggregation (CA) has been identified as a key technology that will be crucial for LTE-Advanced in meeting IMT-Advanced requirements. The need for CA in LTE-Advanced arises from the requirement to support bandwidths larger than those currently supported in LTE (up to 20 MHz) while at the same time ensuring backward compatibility with LTE. Consequently, in order to support bandwidths larger than 20 MHz, CA in LTE-Advanced aggregates or combines two or more component carriers.

An LTE-Advanced terminal with reception capability beyond 20 MHz can simultaneously receive transmissions on multiple component carriers. An LTE Rel-8 terminal, on the other hand, can receive transmissions on a single component carrier (CC) only, provided that the structure of the component carrier follows the Rel-8 specifications.

The spectrum aggregation scenarios can be broadly classified into three categories:

1. Intra-band contiguous CA
2. Intra-band non-contiguous CA
3. Inter-band CA

Examples of these scenarios are provided in the figure below.



Spectrum Aggregation Scenarios for FDD

For LTE Rel-10 CA, each component carrier aggregated together is a LTE Rel-8 carrier. Both contiguous component carriers and non-contiguous component carriers are supported. In LTE Rel-10, both symmetric as well as asymmetric CA is supported. In symmetric CA, the numbers of Downlink (DL) and Uplink (UL) component carriers are the same. In asymmetric CA, the number of DL and UL carriers is different. For simplicity, LTE Rel-10 only supports asymmetrical CA where the number of DL carriers is greater than or equal to the number of UL carriers. In TDD deployments, however, the number of component carriers in UL and DL is typically the same.

The AWS-3 spectrum can be used as one of the bands of an inter-band CA solution aggregated with spectrum in current AWS-1 spectrum or other spectrum that the operator holds.

Supplemental Downlink (SDL)[19]

In most networks today the downlink (DL) payload is much higher than the uplink (UL) payload. Over time as user behavior changes and new technologies like cloud computing evolve and mature, this ratio may change, but the current Mobile Broadband customer consumption is predominately driven by the DL. Supplemental Downlink (SDL) is a form of asymmetric Carrier Aggregation that can be utilized to improve the DL performance by combining paired DL and UL spectrum with spectrum that is assigned for DL only transmission. This is an attractive technology for assigning more radio resources in the DL to improve its performance so that the radio resource capacity is more in accordance with the traffic payload demands.

[19] *Benefits from use of 1452-1492 MHz for Mobile Multimedia Downlink*, FM PT50, 2nd meeting, Ericsson, Qualcomm, *available at* http://www.cept.org/Documents/fm-50/1215/FM50(11)019_Ericsson-Qualcomm-MMDL-Study-FINAL.

Therefore, while recognizing that operators will want to use both the uplink and downlink portions of the spectrum they are buying, that every effort should be made to enable commercial access to 1755-1780/2155-2180MHz as a pair while protecting federal government users, solutions based on realistic protection zones can be implemented. While some solutions such as LSA require further investigation, there can be other intermediate solutions or solutions at particular locations that use 2155-2180MHz as Supplemental Downlink only to provide more Downlink capacity via Carrier Aggregation. Supplemental Downlink technology use enhances the downlink capability of mobile broadband networks by enabling significantly faster downloads and supporting a much greater number of users with mobile or portable wireless devices. Supplemental Downlink and Carrier Aggregation are now enabled in the HSPA+ and LTE-Advanced standards.[20] The technology allows the bonding of the usual downlink with a supplemental downlink channel(s) in the same or in a different band, into a single wider downlink channel. The use of SDL is no longer only a concept. Asymmetric CA has been used successfully in commercial networks in the deployment of Rel-8 Dual Carrier HSPA+. In this implementation two adjacent 5MHz DL carriers are combined with one 5MHz UL carrier. On the LTE side, 3GPP LTE Band 29 (716-728 MHz) was defined for DL only operation. Band 29 is intended to be used for LTE Asymmetric CA with existing band combinations such as Bands 2, 4 or 5. In the Commission's NPRM regarding the TV spectrum voluntary incentive auction, the FCC has proposed that supplemental downlink could potentially be used with orphaned spectrum that is unable to be paired.

[20] Carrier aggregation across bands is supported in HSPA+ R9 (and beyond) and LTE R10 (and beyond) standards, but each specific band combination has to be defined in 3GPP. *See* http://www.3gpp.org/ftp/Specs/html-info/FeatureOrStudyItemFile-600021.htm.

IV. NSN RECOMMENDATIONS REGARDING TRANSMIT POWER OF MOBILE AND PORTABLE STATIONS IN THE 1695-1710MHZ AND 1755-1780MHZ BANDS.

NSN agrees with the Commission that the 1695-1710 MHz and 1755-1780 MHz bands should be Uplink bands and 2155-2180 MHz a Downlink band. NSN also agrees with CSMAC that the Protection Zones can trigger coordination between commercial users and the federal government users and also that the typical commercial user equipment will be LTE devices. However, NSN does not agree with the Commission's proposal to limit the EIRP power to 20 dBm (100 mW) for mobiles and portables (handhelds) operating in the 1695-1710 MHz and 1755-1780 MHz bands. It would be inconsistent with Commission precedent in terms of adopting flexible-use service rules for bands that will support terrestrial wireless service. LTE technology uses very sophisticated Transmit Power Control as discussed during the CSMAC process to adjust the transmit power of the LTE devices. This should be taken advantage of in the rules by allowing maximum flexibility to the licensees to manage their network and limit the transmit power of the devices in their networks as needed so as not to cause any interference to the Government users when and where they are using the spectrum.

The Part 27 AWS rules specify a power limit of 1 watt EIRP for the AWS-1 uplink band (1710-1755MHz). This AWS-1 power limit was intended to simplify coordination with Government operations that remained in the 1710-1755 MHz band.[21] Since the 1695-1710 MHz and 1755-1780 MHz bands both contain Government operations, it could be logical that these two uplink bands have the same 1 watt EIRP limit as for the AWS-1 uplink band.

[21] *See* Service Rules for Advanced Wireless Services in the 1.7 GHz and 2.1 GHz Bands, WT Docket No. 02-353, *Report and Order*, 18 FCC Rcd 25162, 25200 ¶ 98 (2003).

A maximum 25 dBm EIRP consistent with 3GPP standards would allow higher flexibility for licensees to cost efficiently deploy and manage their networks' operations and avoid harmful interference to the government operations, and would not require enlarging the Protection Zones. As discussed previously, the CSMAC efforts identified a list of items which may in fact lead to the ability to significantly alter the technical analysis done and potentially change the conclusions. In addition, the commercial licensees should be allowed the flexibility to use the maximum transmit power allowed in the LTE standards if this is not causing any interference to the government operations. For instance, if the government is not using the spectrum at certain locations, a commercial licensee should be allowed to use the maximum transmit power as allowed by the standards and reduce its power via transmit power control or even evacuate the spectrum completely when the government is using the spectrum.

V. CONCLUSION

NSN continues to strongly support the Commission's ongoing efforts to bring additional spectrum to market for commercial mobile broadband services. The spectrum that is the subject of this NPRM is a significant component. In particular, NSN believes that the 1755-1780 MHz Band should be paired with 2155-2180 MHz and made commercially available in a timely fashion with the clearing of incumbent federal government users from 1755-1780 MHz unquestionably the ultimate objective. NSN also emphasizes that early commercial access to the band should be permissible due to a variety of available tools.

Respectfully submitted,

Nokia Solutions and Networks

/*Derek Khlopin*/

_____

Derek Khlopin
Head of Government Relations
North America

Prakash Moorut
Senior Research Specialist
Technology & Strategy

575 Herndon Parkway
Suite 200
Herndon, VA 20170

September 18, 2013